APPENDIX G

VEHICLE OPERATIONS IN ADVERSE WEATHER

This appendix contains information and guidelines that will help drivers and mechanics to operate and maintain motor vehicles during winter weather. For information covering winterization, arctic techniques, engine enclosures, auxiliary starters, and cold temperature expedient devices, see FMs 9-207, 31-70, and 31-71.

G-1. EFFECTS OF LOW TEMPERATURES ON MATERIALS. When materials essential to motor vehicle operations are exposed to low temperatures, the following occurs:

- Rubber becomes stiff and brittle. Radiator and heater hoses may crack and break if handled roughly. Also, after a vehicle has been parked for several hours, its tires develop flattened-out areas and have little resiliency. The tires will soften once normal operations are resumed.
- Water freezes and expands. Expansion in restricted areas exerts tremendous power and may split radiators or crack engine blocks.
- Canvas becomes stiff and brittle. It is difficult to fold, unfold, or use without damaging.
- Glass conducts heat poorly and may crack or shatter if subjected to a sudden increase in temperature. Do not apply sudden, intense heat to clear or deice vehicle windows or windshield.
- Engine oils become thick and flows poorly. This results in poor lubrication of the engine until warmed by normal operation. Thickened oils also creates a drag on the engine, making starting more difficult.
- Grease becomes hard and thick and loses lubricating properties until it is warmed by normal operations.

CAUTION

Dry, cold weather creates excessive amounts of static electricity in clothing and in liquids being transported. Exercise extreme caution when refueling vehicles to prevent fire and/or explosion caused by the discharge of static electricity. Static electricity should be removed by grounding vehicles or fuel containers before refueling. Personnel should ground themselves by touching the metal of a vehicle or fuel container, away from the openings.

G-2. DRIVING. The basic rules for driving in cold weather encompass all the rules that apply in normal conditions. However, the added hazards of snow and ice greatly increase the need to observe these rules. Before engaging in cold weather operations, all drivers must be thoroughly trained in winter driving techniques.

G-3. VISIBILITY. Good all-around visibility is essential to safe, cold weather driving. To achieve optimum visibility during cold weather--

- Remove all ice, snow, and fog from all windows before operating vehicle.
- Keep all windows and mirrors clear at all times during operations.
- Use defrosters and windshield wipers to keep the windshield free of ice, sleet, snow, and fog.
- Keep inside and outside rearview mirrors clean and properly adjusted.
- Use headlights during snowstorms and periods of reduced visibility according to local SOPs and the tactical situation.
- Increase gaps between vehicles when exhaust gases cause ice fog.
- Use a guide when backing the vehicle or where assistance is required in picking a trail in deep snow.

G-4. TRACTION FOR DRIVING OR STOPPING. Use the following techniques to increase traction for driving or stopping:

- Use chains in deep snow or on ice. Chains increase traction for both starts and stops.
- Use brush and burlap under the wheels to aid in moving through deep snow. Use sand and gravel for passage over icy areas.
- Apply brakes using a feathering or pumping action. Jamming the brakes will lock the wheels and cause skidding.
- Keep pioneer tools readily available on vehicles to remove snow, cut brush, and so forth.

G-5. ADDED GUIDELINES FOR SAFE OPERATIONS. Guidelines for safe vehicle operations in cold weather also include the following:

- Never leave the engine of a vehicle running when you are sleeping in the cab or passenger compartment of the vehicle. Exhaust gases are deadly.
- Always adjust vehicle speeds to road conditions.
- Maintain the proper interval between vehicles; allow more space for bad road conditions. (Stopping distances on ice and snow are greatly increased.)
- Slow down before going around a curve.
- Make turns and stops slowly and steadily.
- Keep the vehicle cab windows open slightly when the heater is in use.
- When halting, do not block the roadway. Pull onto the shoulder but only after it is checked. Snow may conceal ditches, culverts, or other obstructions.
- Do not overcrowd the vehicle cab. This restricts the driver's ability to operate his vehicle properly and safely.
- At halts, check vehicles to ensure that they are trouble-free and in good operating condition.
- Keep lights, mirrors, and windows free of snow, sleet, frost, or fog.
- Ensure that vehicle operators and maintenance personnel are properly trained and thoroughly familiar with the operation and maintenance of vehicles in extreme cold (FM 9-207).

G-6. PREPARING FOR OPERATIONS. To prepare for cold weather operations--

- Always carry a shovel on the vehicle. The removal of snow or ice from in front of or behind the wheels may enable a stuck vehicle to clear itself.
- Wear gloves. Avoid touching subzero chilled metal with bare hands. If tools must be used, tape or wrap the handles.
- Move vehicles slowly and carefully after they have been standing in the cold for a significant period.
- Distribute loads as evenly as possible to equalize traction on the wheels. Reduce load capacities in severe cold weather.
- When appropriate or permissible, block up the rear end of the engine hood to allow warm air from the engine to flow over the windshield. This will aid in keeping it clear.
- Shield the lower half of the radiator with prepared winterfronts, shutters, cardboard, or other available material to aid in maintaining normal operating temperatures.
- Use grass, straw, or other insulating materials on the cab floor (and bed of troop-carrying vehicles) to help keep feet warm if the vehicle has no heater or in case the heater fails to function.
- Check tire pressure before operations. Increase the pressure about 10 percent for severe cold weather operations.
- Use auxiliary type heaters to warm engines before starting when temperatures dip below -25^{o} F (-3.9^{o} C).
- Observe all instruments, gauges, and warning lights during warm-up to avoid engine damage.
- Warm up engines to operating temperatures before moving or accelerating.

G-7. MAINTENANCE AND SERVICE. Use the following techniques to maintain and service vehicles during cold weather:

- Change engine oil more frequently to reduce the possibility of contamination.
- Keep the crankcase ventilator clear to avoid condensation of moisture and fuel vapors in the crankcase.
- Keep fuel tanks and containers as full as possible to prevent moisture from condensing and freezing in fuel lines. Keep fuel tank and container caps (covers) tightly closed to prevent the entry of snow, ice, and moisture.
- Drain fuel filters frequently.
- Use proper antifreeze and do not mix types. Allow for heat expansion of the coolant when filling radiators.
- Frequently check and clear relief vents on transfer cases, transmissions, and axles.
- Make complete changes of engine and gear oils when required. Avoid mixing various types or grades. Use lighter oils when recommended by the manufacturer.
- Clear snow, slush, and ice from wheels, suspension, and brake systems immediately after stopping to prevent freezing and resulting damage.
- Park vehicles on brush, logs, sand, or other dry surfaces to prevent tires from freezing to the ground.
- Do not attempt to break free a vehicle frozen in place in a parking or halt area by using its own power to rock or jerk it loose. Use another vehicle to tow (or push) the frozen vehicle.
- Avoid using sharp or pointed tools to free tires frozen to the ground.

G-8. TRUCK AND CONVOY OPERATIONS. Use the following techniques during cold weather truck and convoy operations:

- Exercise care in cross-country operations. Improper operation through or over brush, branches, stumps, and rocks may cause damage to radiators, lights, tires, and vehicle undercarriages.
- Recover vehicles that bog down in mushy ice or break through ice as quickly as possible to prevent their freezing in.
- As required, provide each vehicle with--

  - Driver's personal gear and field equipment.
  - Vehicle maintenance tools.
  - Operational rations for emergency use.
  - Extra engine oil, fuel, and antifreeze.
  - Tow and tire chains.
  - Pioneer tools.
  - Strip maps.
  - Fire starters.
  - Highway flares and safety kits.

- Inspect brake lines frequently. Remove accumulations of slush, ice, and snow to prevent line breakage.
- If you are uncertain about a difficult stretch of road, stop and look the situation over before proceeding.

CAUTION
A snow-covered road may conceal an icy road surface. Be careful when driving on fresh snow.

- At a difficult piece of road or a snow drift, let the lead vehicle go through before driving more vehicles into the same spot. If the lead vehicle becomes stuck, it may be necessary to pull it out backwards.
- When approaching a difficult spot, shift the vehicle into low gear and then keep moving. Stopping to shift gears after reaching a bad spot may cause the wheels to spin and dig in and the vehicle to become bogged down.
- If the vehicle is stuck, rocking the vehicle forward and backward by rapidly shifting between low and reverse may provide a long enough solid track for the vehicle to gain enough momentum to go through.
- When stopping on any slippery road, apply the brakes gently. Jamming or slamming on the brakes may cause a bad skid. This is especially true on ice or light snow.
- Never depend on brakes when descending a slippery hill. Shift into a lower gear at the crest and use the engine for braking on the down slope.
- Chains serve a good purpose in snow or mud but are less effective on ice. A few shovels full of sand or earth scattered over an icy grade create as much or more traction than chains.

- Never accelerate quickly on slippery roads. Doing so may cause one wheel to spin while the other remains idle, resulting in a skid.
- To overcome a skid, turn the front wheels in the direction of the skid. The momentum of the vehicle will carry it in a straight line parallel to the original path, and you should regain control.
- Avoid ruts that may cause a skid or bruise a tire. When halting for some time, chock the wheels if possible. Leave the hand brake off. This prevents the brakes from becoming frozen in a locked position.
- Before parking a vehicle and if conditions permit, apply the brakes severely several times. This heats the brake shoes and drums and helps to rid the drums of any water that may have accumulated.
- When crossing on ice over frozen streams, keep the cab doors open. You may need to leave in a hurry if the ice is thin.
- Know and use proper signals. This is most important in winter driving when roads are treacherous and visibility is poor.
- Remember that when sleet or snow is melting on the roads, it may be freezing or frozen on bridges.
- When driving in a heavy snowstorm, in rain or fog, or under other poor visibility conditions, use vehicle lights to warn other drivers of your position. Keep your lights on the regular driving beam, not on high beam.
- If visibility becomes zero, stop and wait for better conditions.
- If the radiator antifreeze is lost and a new supply is unavailable, add light lubricating oil or fuel oil to the radiator liquid. This will get the vehicle back to its base or on to the next point where antifreeze can be obtained. (Flush the radiator thoroughly before replacing the coolant.)